What is claimed is:

1. A block copolymer characterized by the general formula $(AB)_n$-Core, where A and B are polymeric blocks and Core is a non-polymeric linking core; wherein said block copolymer comprises at least one random block comprised of two or more monomers, wherein at least one of said two or more monomers is hydrophilic and at least one of said two or more monomers is hydrophobic such that an absolute difference in log p between said at least one hydrophobic and hydrophilic monomers is at least about 0.5; and n is 2 or more; and provided that said block copolymer is at least partially soluble or miscible in water or alcohol or a combination thereof at room temperature.

2. The block copolymer of claim 1, wherein said random block is either an A or B block.

3. The block copolymer of claim 1, wherein said random block is disposed between at least one of said A and B blocks.

4. The block copolymer of claim 1, wherein said linking core is a di-functional initiator-control agent adduct and n is 2, such that upon formation of said block copolymer there are two A blocks, one at each terminus end of said B block.

5. The block copolymer of claim 3, wherein said linking core is selected from the group consisting of 4-arm, 6-arm, 8-arm and 12-arm stars.

6. The block copolymer of claim 1, wherein a ratio of said two or more monomers in said random block is chosen such that an increase in the proportion of said at least one hydrophobic monomer results in a decrease in the miscibility or dispersability of the block copolymer.

7. The block copolymer of claim 1, wherein a ratio of said two or more monomers in said random block is chosen such that a decrease in the proportion of said at least

one hydrophobic monomer results in an increase in the miscibility or dispersability of the block copolymer.

8. A block co-polymer that is at least partially soluble or miscible in water, comprising a polymer having at least the structure A-B-A, where A and B are polymeric blocks, and wherein said polymer comprises at least one random block comprised of two or more monomers, provided that at least one of said two or more monomers in said random block is hydrophilic and at least one of said two or more monomers is hydrophobic, wherein the absolute difference in log p between said hydrophobic and hydrophilic monomers is at least about 0.5.

9. The block copolymer of claim 8, wherein said random block is either an A block or a B block.

10. The block copolymer of claim 8, wherein said random block is disposed between at least one of said A and B blocks.

11. The block copolymer of claim 8, wherein a ratio of said two or more monomers in said random block is chosen such that an increase in the proportion of said at least one hydrophobic monomer results in a decrease in the miscibility or dispersability of the block copolymer.

12. The block copolymer of claim 8, wherein a ratio of said two or more monomers in said random block is chosen such that a decrease in the proportion of said at least one hydrophobic monomer results in an increase in the miscibility or dispersability of the block copolymer.

13. The block copolymer of either claims 1 or 8, wherein said A block has a number average molecular weight that is within 20% of the number average molecular weight of said B block.

14. The block copolymer of either claims 1 or 8, wherein said A block has a number average molecular weight is less than 50% of the number average molecular weight of said B block.

15. The block copolymer of either claims 1 or 8, wherein block A has a glass transition temperature above at least about 22°C.

16. The block copolymer of either claims 1 or 8, wherein block B has a glass transition temperature below at least about 22°C.

17. A process for preparing a block copolymer of either claims 1 or 8, the process comprising polymerizing telechelic polymers of blocks A and B and attaching said telechelic polymers together with covalent bonds.

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18. A process for preparing a block co-polymer of either claims 1 or 8, the process comprising: polymerizing block B in an un-controlled free radical polymerization process and growing said A blocks from said B blocks in a living-type polymerization.

19. A process for preparing a block co-polymer of either claims 1 or 8, the process comprising:

(1) forming a mixture of

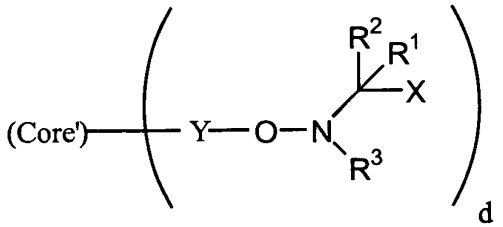
(a) a multi-functional initiator, a multi-functional chain transfer agent or a multi-functional initiator-control agent adduct; and

(b) one or more monomers that comprise the B block

(2) subjecting said mixture to polymerization conditions with living-type kinetics to form said B block; and

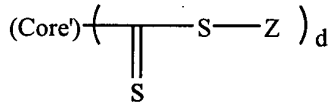
(3) adding one or more monomers to said polymerization mixture to form said A block.

20. The process of claim 18, wherein a multi-functional initiator-control agent adduct is present and is characterized by the formula:



where Core' is a core molecule; d is 2 or more; Y is a residue capable of initiating a free radical polymerization upon homolytic cleavage of the Y-O bond, the residue being selected from the group consisting of fragments derived from a free radical initiator, alkyl, substituted alkyl, alkoxy, substituted alkoxy, aryl, substituted aryl, and combinations thereof; X is a moiety that is capable of destabilizing the control agent on a polymerization time scale; and each $R^1$ and $R^2$, independently, is selected from the group consisting of alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, heteroalkyl, heterocycloalkyl, substituted heterocycloalkyl, aryl, substituted aryl, heteroaryl, substituted heteroaryl, alkoxy, aryloxy, silyl, boryl, phosphino, amino, thio, seleno, and combinations thereof; and $R^3$ is selected from the group consisting of tertiary alkyl, substituted tertiary alkyl, aryl, substituted aryl, tertiary cycloalkyl, substituted tertiary cycloalkyl, tertiary heteroalkyl, tertiary heterocycloalkyl, substituted tertiary heterocycloalkyl, heteroaryl, substituted heteroaryl, alkoxy, aryloxy and silyl.

21. The process of claim 18, wherein a multi-functional chain transfer agent is present in said mixture with an initiator and said multi-functional chain transfer agent is characterized by the general formula:



wherein Core' is a core molecule, S is sulfur and Z is any group that activates the C=S double bond towards a reversible free radical addition fragmentation reaction.

22. A process for preparing a block co-polymer of claim 1, comprising polymerizing an AB block is by living free radical polymerization by virtue of a control agent bound to the B terminus, said control agent being allowed to react with a n-functional compound to form the desired blocked copolymers $(AB)_n$-Core.